The National Center for Manufacturing Sciences (NCMS) and the Commercial Technologies for Maintenance Activities (CTMA) Program

Discussions with the Condition Based Maintenance Plus Working Group

25 February 2005

Chuck Ryan, Vice President, Technology

National Center for Manufacturing Sciences

Flow of Briefing

- Brief NCMS/CTMA Overview
- Active Projects
  - LAV condition based maintenance
  - Parts Marking
  - Damage/Wear Assessment
- Process for New Projects
- Emerging Projects
- Open issues

NCMS Mission

The NCMS mission is to build the global competitiveness and strengthen the US-based manufacturing industry, private and public.

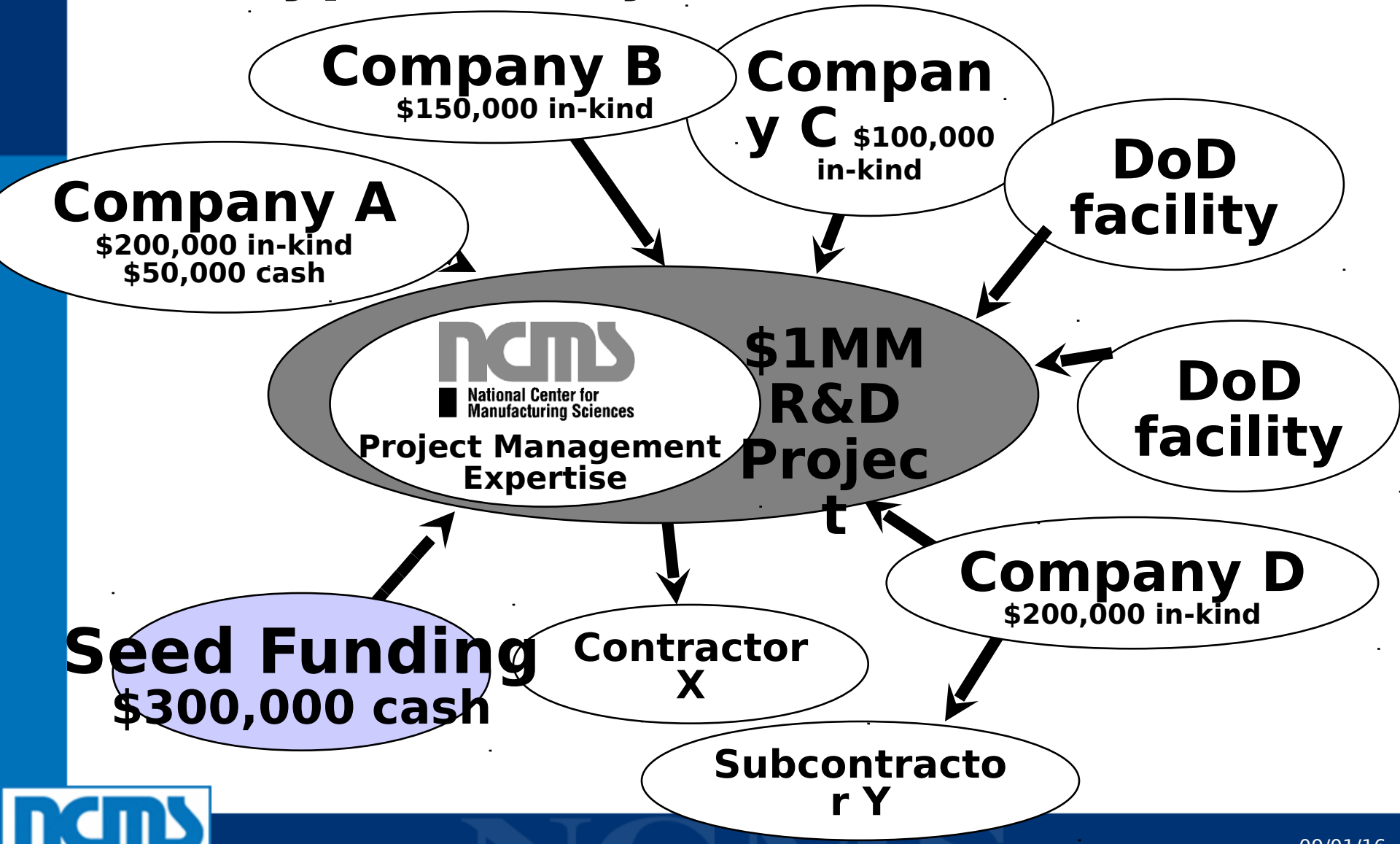
Who we are...


Ford
RVSI
GM
DaimlerChrysler
EDS
USCAR
Rolls-Royce
General Lasertronics Corporation
University of Michigan
MichiganTech
AMT
The Association For Manufacturing Technology
Kodak
IMPACT Engineering
Benchmark Electronics INC
GE Aircraft Engines
Parelec
acer
INTELLI WORXX
HY-TECH
Rockwell Automation
MOTORSOFT
intel.
EXTRUDEHONE
UNOVA
Cross Hüller
ThyssenKrupp
Foster-Miller
PPG Industries
Baxter
Kettering University
Stratasys
NAMF
Collins&Aikman
COMAU
RLWINC.
EMBEDDEDSOFTWARE
StorageTek
GENERAL PATTERN COMPANY
SOLIDICA
adept
ADEPT TECHNOLOGY, INC.
precarn
MicroDexterity Systems
LIS
Laser Imaging Systems
NASA
OAI
PRICEWATERHOUSECOOPERS
MLI
Manufacturing Laboratories, Inc
VIC Leak Detection
imes INC
GAGE
Kinefac Corporation
AvPro
Eclypse International Corporation
Precon
Raytheon
WISCONSIN Department of Commerce
THE AEROSTRUCTURES CORPORATION
MicroFab TECHNOLOGIES • INC.
DCT DEFORMATION
BOEING
Honeywell
Hamilton Sundstrand
A United Technologies Company
EATON
DELPHI
United Technologies
ASU ARIZONA STATE UNIVERSITY
WAYNE STATE UNIVERSITY
GENERAL ATOMICS Energy Products
Endicott Interconnect
AMATROL
3D SYSTEMS
NEMI National Electronics Manufacturing Initiative, Inc.
HPM CONSORTIUM
CATERPILLAR
National Research Council Canada
Automated Precision Inc.

We Deliver….

- Technology solutions
- Strategic partnerships
- Neutrality
- Program management expertise
- Business practice solutions
- Knowledge capture & e-learning solutions
- Networking opportunities

A Typical Project- What We Do



Commercial Technologies for Maintenance Activities (CTMA)

- Identify, form, launch and deploy new projects coupling the needs and strengths of commercial industry with the DoD's maintenance, repair and remanufacturing facilities
- Focus on reducing overall costs and increasing readiness
- Cooperative Agreement between NCMS and the Office of the Secretary of Defense (David Pauling)
- DoD-industry co-funding on a 2:1 match basis
- http://ctma.ncms.org

DoD Participants

- Tobyhanna Army Depot (AD)
- Corpus Christi AD
- Red River AD
- Anniston AD
- Letterkenny AD
- Fort Richardson AD, Fort Wainwright AD
- Fort Lewis AD

- Oklahoma City Air Logistics Center (ALC)
- Ogden (ALC)
- Warner Robins (ALC)
- Elmendorf AFB, Eielson AFB

- Marine Corps Maintenance Center Albany
- Marine Corps Maintenance Center Barstow

- Naval Air Depot North Island (NADEP)
- NADEP Jacksonville
- NADEP Cherry Point

- Norfolk Naval Shipyard (NSY)
- Portsmouth NSY
- Pearl Harbor NSY
- Puget Sound NSY

- Naval Submarine Base- Kings Bay
- Naval Submarine Base- Bangor

- Naval Undersea Warfare Center, Keyport
- Naval Surface Warfare Center, Crane

CTMA Ongoing Projects

- ***LAV Life-Cycle Logistics Support Tool***
- ***Retrograde Part Identification Using 2nd Generation Permanent Marking Techniques***
- ***Damage Wear Assessment of Rotating Equipment***
- Advanced Digital Fabrication and Repair
- Robotic Painting Optimization
- Automated Test Equipment - Synthetic Instrumentation Insertion
- Legacy Test Program Set (TPS) Migration System
- Isotropically Conductive Adhesives
- Laser Engineered Net Shaping
- Barstow Air Pollution Control System (APCS) Improvements
- Lifecycle Product Data Management for Six Sigma Quality
- Replacement for Hexavalent Chromium in Surface Finishing Processes
- Next Generation Inspection Systems
- Hard Chrome Plating Tooling
- Smart Machines
- Laser Coating Removal Systems
- Enhanced Wiring Integrity
- Flat Wire Deposition Process
- OptiCam/IPOMX

As of February 2005

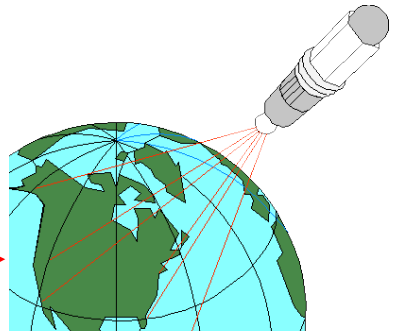
Light Armored Vehicle Condition Based Maintenance

- This project shall deploy and test new predictive condition-based maintenance methods for the Light Armored Vehicle (LAV) community.
  - Diagnostic sensors, remote support-based telematics, secure communication, condition based software, and web portal data delivery shall be deployed, tested and integrated with and on legacy weapon systems.

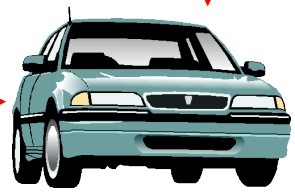
Leveraging Advanced Technologies

- This project is leveraging the best of advanced automotive technologies that are currently being utilized in the private sector.

Commercial Parallel Vision



DELPHI Diagnostic Command Center



Light Armored Vehicle CBM

- Participants
  - Delphi Corp
  - Portal Dynamics
  - Cubic Systems
  - TACOM
  - USMC Albany
  - USMC Barstow
  - ANAD

Light Armored Vehicle CBM

- Cost, Schedule, Status
  - Cost $2.8M Total
    - $2.0M in-kind
    - $0.8 contracts
  - Schedule-18 months ending 3/05
  - Status-Writing final report

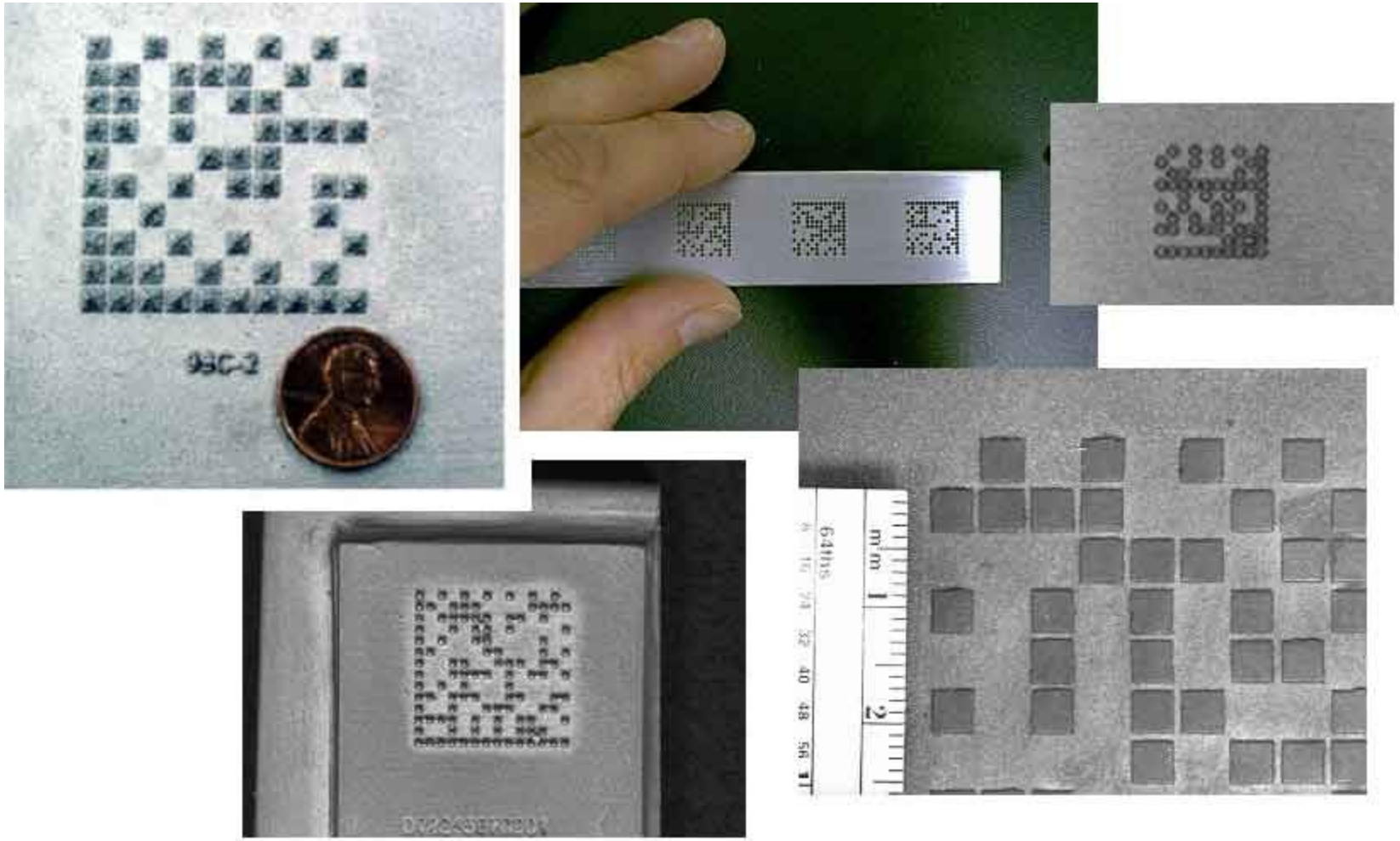
Retrograde Part Identification Using 2nd Generation Permanent Marking Techniques

Program Objectives

- Develop robust marking methods that will survive harsh operational conditions and overhaul processes (during and after manufacturer).
- Design, manufacture, test, and commercialize a family of portable part identification marking devices designed to mark parts in the field (both installed and uninstalled).
- Develop mark restoration kits and procedures
- Develop portable reading devices that can be used to image and decode symbols that have been discolored, contaminated, or coated over with protective coatings and paints.

Government Customers Affected

- Defense Logistics Agency
- Department of Defense
- Department of Transportation
- Federal Aviation Administration
- National Aeronautics & Space Administration
- National Transportation Safety Board
- United States Army
- United States Air Force
- United States Coast Guard
- United States Marine Corps
- United States Navy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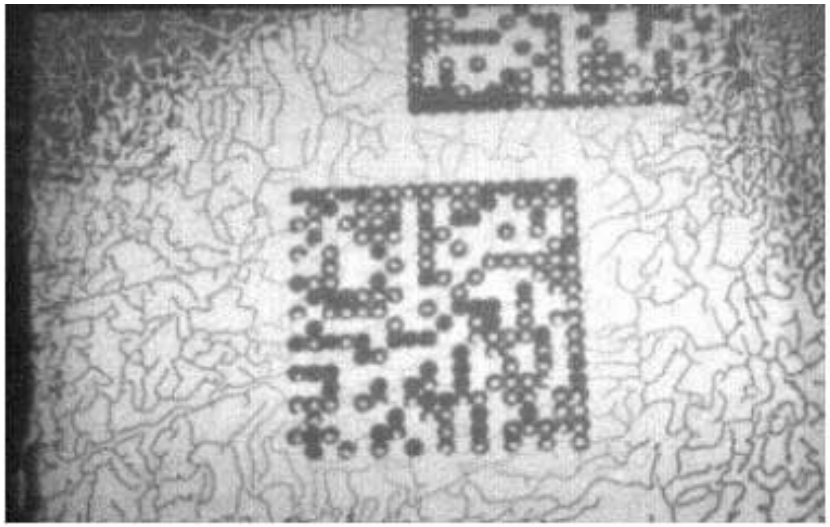


First Operational Magneto-Optic Imagers Being Utilized In Read-Through-Paint Trials

Deliverable - 3 Mobile Markers

- Common User Friendly Software
- Electro-Chemical Etch
- Hand-Held and Fixed Dot Peen
- Micro-Milling
- Hand-Held and Fixed Lasers
- Stencil Generation
- Labels
- On Board Symbol Reading and Verification

Industry Participants

- Solar Turbine
- Waterjet Tech
- Robotic Visions Systems, Inc (RVSI)
- Monode Marking Products
- Optomec
- University of Tennessee Space Institute (UTSI)
- Ford AMTD

Depot Participants

- US Air Force – Ogden Air Logistics Center (Hill AFB)
- US Army – Letterkenny Army Depot
- US Navy – Cherry Point NADEP

Damage and Wear Assessment Using Condition-Based Monitoring

- Evaluate condition based monitoring used in predictive maintenance
- Determine alternate technology to Vibration Analysis for assessing rotating machinery
- Improve the assessment of detection of rotating machinery faults:
  - Damage
  - Wear
  - Misalignment
  - Lubrications problems

Proposed Solutions

- Assess the viability of Acoustic Emissions (AE) based system for detection
- Drive communication between machine and maintenance activity
- Enable timely intervention
- No sophisticated knowledge or training required
- Detection not analysis
- Provide information for cause and effect analysis

Deliverables

- Detection of Bearing Failure
  - Trendable measure of condition
- Allowing
  - Reduction in repair costs
  - Reduction in unplanned downtime
  - Prevention of the loss of capital equipment
  - Reduces safety & environmental risks
- Improvement over traditional measures
  - Earlier detection
  - Simpler use

Participants

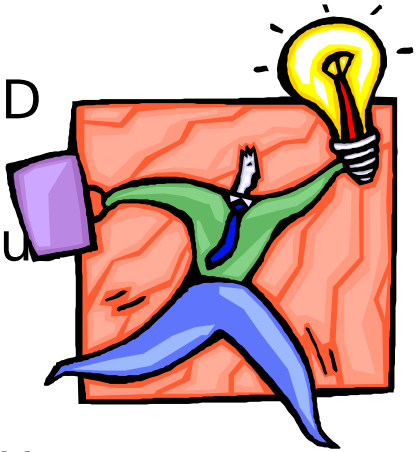
- Depot
  - Barstow Marine Corporation Logistics Base
  - Cherry Point Naval Air Depot
  - Portsmouth Naval Ship Yard
  - Red River Army Depot
  - Us Marine Corp Albany
- Industry
  - Ford Essex Engine Plant
  - Ford Sharonville Transmission Plant
  - Ford Van Dyke Plant
  - Ford Windsor Casting Plant
  - Ford Windsor Aluminum
- Academic
  - Wayne State University

CTMA Project Launch Criteria

- Begins with a one page description
- Project team constructs project concept paper (~7 pages long)
- Joint Industry/DoD interest and needs
  - Hard deliverables, direct impact on manufacturing shop floor
- Cost/Benefits summary sketched out
  - Quantifiable
- Participant roles defined
- Validated Industrial cost-share
- Letter of endorsement from base command
- Submission of concept to Pentagon (Office of Secretary of Defense)
- 10 day turnaround for approval…

Hurdles for New Project Ideas

- What new technology is being developed and implemented?
  - Not a mechanism for circumventing DoD procurement process.
  - Development and implementation versus research and development
- Is there cross-service involvement?
  - For broader dissemination of technology
- Is there sufficient industrial interest?
  - Greater than 2:1 cost share



Current Emerging Projects for 2005

1. High Speed Laser Depainting
2. Inspection and Repair Preparation Cell for Radomes (IRPC)
3. Heat Transfer Classification for Production Tooling and Composite Repairs
4. Kinetic Spray Metal Deposition Technologies for Corrosion Protection
5. Transient Liquid Phase Bonding
6. On-Board Wiring Diagnostics Tester
7. Real Time Inspection System for Reconfigurable Presses
8. Large Airfoil Scanning System
9. Honeycomb Inspection and Defect Detection
10. Static Event Detector Initiative
11. Emission Reduction from Chromium Plating Tanks
12. Sulfamate Nickel No-Mask Anodes
13. Casting Cost Estimator
14. Heat Treat Lean Cell
15. Automated Development of 3D Animated Graphical Work Instructions
16. Lean Machining Cell
17. Siemat® Acoustic Thermography
18. Low-Cost 3-D Imaging Inspection System

Current Issues

- Defining DoD facility for project participation
  - Currently choose based upon interest
  - Future choice based on need
    - Smart Machines – what manufacturing processes need to be better monitored for improving readiness
    - Better candidates for emerging projects
      - Process for defining
- Obtaining letters of support from the Air Force
  - Organizational disconnects at the ALC

Communications and Networking

- CTMA Website (http://ctma.ncms.org)
- The CTMA Connector Newsletter
- Symposium 2005 is April 18-21 at the Tacoma Sheraton, Washington “Where Ideas Become Reality”
  - Keynote speaker includes: VADM Phillip Balisle
  - Tour includes PSNS/Keyport

NCMS - CTMA

Thank You

Questions?